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WHAT IS CLAIMED IS:

1. A light-receiving device which converts an incident light into an electric current, comprising:

quantum-wave interference layer units having plural periods of a pair of a first layer and a second layer, said second layer having a wider band gap than said first layer;

a carrier accumulation layer disposed between adjacent two of said quantum-wave interference layer units; and

wherein each thickness of said first and said second layers is determined by multiplying by an even number one fourth of quantum-wave wavelength of carriers in each of said first and said second layers and said carrier accumulation layer has a band gap narrower than that of said second layer.

2. A light-receiving device according to claim 1, wherein a kinetic energy of said carriers which determines said quantum-wave wavelength is set at a level near the bottom of a conduction band and a valence band of said second layer, according to the case that said carriers are electrons and holes, respectively.

3. A light-receiving device according to claim 1, wherein a quantum-wave wavelength λ_W in said first layer is determined by a formula $\lambda_W = h/[2m_W(E+V)]^{1/2}$, a quantum-wave wavelength λ_B in said second layer is determined by a formula $\lambda_B = h/(2m_BE)^{1/2}$, said thickness of said first layer

D_W is determined by a formula $D_W = n_W \lambda_W / 4$, and said thickness of said second layer D_B is determined by a formula $D_B = n_B \lambda_B / 4$, where h, m_W, m_B, E, V, and n_W and n_B represent Plank's constant, effective mass of said carrier in said first layer, effective mass of said carrier in said second layer, kinetic energy of carriers flowing into said second layer, potential energy of said second layer to said first layer, and even numbers, respectively.

4. A light-receiving device according to claim 2, wherein a quantum-wave wavelength λ_W in said first layer is determined by a formula $\lambda_W = h/[2m_W(E+V)]^{1/2}$, a quantum-wave wavelength λ_B in said second layer is determined by a formula $\lambda_B = h/(2m_B E)^{1/2}$, said thickness of said first layer D_W is determined by a formula $D_W = n_W \lambda_W / 4$, and said thickness of said second layer D_B is determined by a formula $D_B = n_B \lambda_B / 4$, where h, m_W, m_B, E, V, and n_W and n_B represent Plank's constant, effective mass of said carrier in said first layer, effective mass of said carrier in said second layer, kinetic energy of carriers flowing into said second layer, potential energy of said second layer to said first layer, and even numbers, respectively.

5. A light-receiving device according to claim 1 comprising:

a plurality of partial quantum-wave interference layer I_k with T_k periods of a pair of said first layer and said

second layer being displaced in series by varying k as 1, 2, …, and

wherein index k of said plurality of said partial quantum-wave interference layers correspond to index k of kinetic energy level E_k and said first and second layers have thicknesses of $n_{Wk}\lambda_{Wk}/4$, and $n_{Bk}\lambda_{Bk}/4$, respectively, where E_k+V and E_k, λ_{Wk} and λ_{Bk}, and n_{Wk}, n_{Bk} represent kinetic energy level of carriers flowing into respective said first layer and said second layer, wavelength of quantum-wave of carriers flowing into respective said first layer and said second layer, and even numbers, respectively, and λ_{Wk} and λ_{Bk} are determined by functions of E_k+V and E_k, respectively.

6. A light-receiving device according to claim 2 comprising:

a plurality of partial quantum-wave interference layer I_k with T_k periods of a pair of said first layer and said second layer being displaced in series by varying k as 1, 2, …, and

wherein index k of said plurality of said partial quantum-wave interference layers correspond to index k of kinetic energy level E_k and said first and second layers have thicknesses of $n_{Wk}\lambda_{Wk}/4$, and $n_{Bk}\lambda_{Bk}/4$, respectively, where E_k+V and E_k, λ_{Wk} and λ_{Bk}, and n_{Wk}, n_{Bk} represent kinetic energy level of carriers flowing into respective said first layer and said second layer, wavelength of quantum-wave of carriers flowing into respective said first layer and said

second layer, and even numbers, respectively, and λ_{Wk} and λ_{Bk} are determined by functions of E_k+V and E_k, respectively.

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~~7. A light-receiving device according to claim 1, wherein said carrier accumulation layer has the same bandwidth as that of said first layer.~~

~~8. A light-receiving device according to claim 3, wherein said carrier accumulation layer has the same bandwidth as that of said first layer.~~

~~9. A light-receiving device according to claim 5, wherein said carrier accumulation layer has the same bandwidth as that of said first layer.~~

10. A light-receiving device according to claim 3, wherein said carrier accumulation layer is formed to have a thickness same as said quantum-wave wavelength λ_W.

11. A light-receiving device according to claim 8, wherein said carrier accumulation layer is formed to have a thickness same as said quantum-wave wavelength λ_W.

12. A light-receiving device according to claim 9, wherein said carrier accumulation layer is formed to have a thickness same as said quantum-wave wavelength λ_W.

13. A light-receiving device according to claim 1, wherein a δ layer is formed between said first layer and said second layer, said δ layer is substantially thinner than said first layer and said second layer, and sharply varies an energy band.

14. A light-receiving device according to claim 3, wherein a δ layer is formed between said first layer and said second layer, said δ layer is substantially thinner than said first layer and said second layer, and sharply varies an energy band.

15. A light-receiving device according to claim 8, wherein a δ layer is formed between said first layer and said second layer, said δ layer is substantially thinner than said first layer and said second layer, and sharply varies an energy band.

16. A light-receiving device according to claim 10, wherein a δ layer is formed between said first layer and said second layer, said δ layer is substantially thinner than said first layer and said second layer, and sharply varies an energy band.

17. A light-receiving device according to claim 1 further comprising:

a pin junction structure; and

wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an i-layer.

18. A light-receiving device according to claim 3 further comprising:

a pin junction structure; and

wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an i-layer.

19. A light-receiving device according to claim 5 further comprising:

a pin junction structure; and

wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an i-layer.

20. A light-receiving device according to claim 8 further comprising:

a pin junction structure; and

wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an i-layer.

21. A light-receiving device according to claim 10 further comprising:

a pin junction structure; and

wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an i-layer.

22. A light-receiving device according to claim 1, wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an n-layer or a p-layer.

23. A light-receiving device according to claim 3, wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an n-layer or a p-layer.

24. A light-receiving device according to claim 5, wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an n-layer or a p-layer.

25. A light-receiving device according to claim 8, wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an n-layer or a p-layer.

26. A light-receiving device according to claim 10, wherein said quantum-wave interference layer units and said carrier accumulation layer are formed in an n-layer or a p-layer.

27. A light-receiving device according to claim 22, further comprising a pn junction structure.

28. A light-receiving device according to claim 23, further comprising a pn junction structure.

29. A light-receiving device according to claim 24, further comprising a pn junction structure.

30. A light-receiving device according to claim 25, further comprising a pn junction structure.

31. A light-receiving device according to claim 26, further comprising a pn junction structure.

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